

## TWO NEW SPECIES OF *THESIUM* AND SOME NOTES ON OTHER SPECIES.

By MARGARET R. LEVYNS.

Among the many species of *Thesium* found on the Cape Peninsula *T. capitatum* L. and *T. carinatum* A.DC. are very similar in appearance and in the field are often difficult to distinguish. On examination, however, in *T. capitatum* the stamens are seen to arise some way up the tube and there is a well-developed style. In *T. carinatum* the stamens are situated at the bottom of the tube, the stigma caps a small conical mound and a definite style is absent.

A. W. Hill in the Kew Bulletin, 1915, suggested that heterostyly might be present here and that field work would be necessary to settle this point. During the last four years field studies on the species of *Thesium* on the Cape Peninsula have been carried out, and it is clear that the phenomenon of heterostyly is not a feature of these plants. Both species have a wide range on the Cape Peninsula but on the slopes above Camps Bay and Clifton *T. carinatum* alone is found. From Smitswinkel Bay southwards *T. capitatum* occurs frequently and *T. carinatum* is rare. In such places the style length and position of the stamens are constant features. On the mountain behind Kalk Bay and Muizenberg where both species are common and grow together, variation in position of the stamens and style length is encountered and the obvious conclusion is that hybridisation is the true explanation of this variability.

Outside the Cape Peninsula *T. carinatum* has an extensive range and is a common mountain plant from the Cederberg in the West to the Swartberg Pass in the Prince Albert Division. *T. capitatum* has a much more restricted range and with the exception of Galpin 4552 from the Humansdorp Division (cited in the Flora Capensis) is confined to an area in the South-West bounded by a line running from the North of the Malmesbury Division to the Caledon Division.

While studying *T. capitatum* it became apparent that two quite distinct species have hitherto been regarded as one. *T. capitatum* is a small plant rarely exceeding 30 cms. in height and usually of a yellow green colour. The leaves may be erect or somewhat spreading. The second species for which the name *T. viridifolium* is proposed, is a much larger plant, often reaching a height of 50 cm. It is copiously branched and has bright green leaves which stand well away from the stem. In the field

it is always easy to separate these two species. Apart from the vegetative characters, well marked floral characters serve to distinguish them. These differences are shown in the accompanying diagrams.

*T. viridifolium* (Fig. 1) has a much longer and narrower perianth tube than *T. capitatum* (Fig. 2). In *T. viridifolium* the perianth lobes are relatively short, the stamens arise high up in the tube and the style is very long. Another distinguishing feature lies in the tips of the perianth segments which in *T. capitatum* are acuminate while in *T. viridifolium* the apex is shorter and not sharply pointed. Linné in the second edition of the Species Plantarum says of *T. capitatum* "Florum

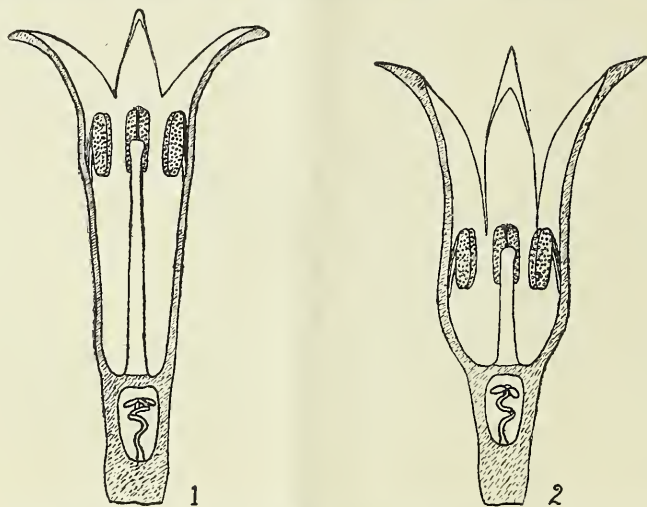


FIG. 1. *Thesium viridifolium*. FIG. 2. *Thesium capitatum*. Longitudinal sections of the flowers  $\times 10$ . (Hairs on the perianth lobes omitted.)

lacineae valde acuminatae," thus leaving no doubt as to which of these two plants must be regarded as *T. capitatum* L.

As far as the present records go *T. viridifolium* is restricted to the southern half of the Cape Peninsula. *T. capitatum* ranges from the summit of Table Mountain to the Cape of Good Hope Nature Reserve.

No cases of hybridisation between these two species have been noted.

***Thesium viridifolium*, Levyns sp. nov.**

*Frutex* erectus, ramosus, copiose foliosus. *Folia* patentia, linearia, viridia. *Flores* apice ramorum capitati. *Perianthium* anguste tubulosum,



approximate solutions and division, especially those which are not exact, but which are very close to the exact solution, and which are very easy to compute.

The first of these is the method of successive approximations, which is a very simple and easy method, and which is very accurate. It is based on the fact that if we have a function  $f(x)$  which is continuous and differentiable, and if we have a point  $x_0$  such that  $f(x_0) \neq 0$ , then we can find a sequence of points  $x_1, x_2, x_3, \dots$  such that  $f(x_n) \rightarrow 0$  as  $n \rightarrow \infty$ . This is done by taking  $x_1 = x_0 - f(x_0)/f'(x_0)$ , and then  $x_2 = x_1 - f(x_1)/f'(x_1)$ , and so on. This method is very easy to use, and it is very accurate. It is especially useful for finding the roots of a function, and for finding the values of a function at points where it is not defined.

The second of these is the method of the Newton-Raphson method, which is a more accurate method than the first. It is based on the fact that if we have a function  $f(x)$  which is continuous and differentiable, and if we have a point  $x_0$  such that  $f(x_0) \neq 0$ , then we can find a sequence of points  $x_1, x_2, x_3, \dots$  such that  $f(x_n) \rightarrow 0$  as  $n \rightarrow \infty$ . This is done by taking  $x_1 = x_0 - f(x_0)/f'(x_0)$ , and then  $x_2 = x_1 - f(x_1)/f'(x_1)$ , and so on. This method is very accurate, and it is very easy to use. It is especially useful for finding the roots of a function, and for finding the values of a function at points where it is not defined.

The third of these is the method of the secant method, which is a method which is very easy to use, and which is very accurate. It is based on the fact that if we have a function  $f(x)$  which is continuous and differentiable, and if we have two points  $x_0$  and  $x_1$  such that  $f(x_0) \neq 0$  and  $f(x_1) \neq 0$ , then we can find a sequence of points  $x_2, x_3, x_4, \dots$  such that  $f(x_n) \rightarrow 0$  as  $n \rightarrow \infty$ . This is done by taking  $x_2 = x_1 - f(x_1)(x_1 - x_0)/(f(x_1) - f(x_0))$ , and then  $x_3 = x_2 - f(x_2)(x_2 - x_1)/(f(x_2) - f(x_1))$ , and so on. This method is very easy to use, and it is very accurate. It is especially useful for finding the roots of a function, and for finding the values of a function at points where it is not defined.

The fourth of these is the method of the bisection method, which is a method which is very easy to use, and which is very accurate. It is based on the fact that if we have a function  $f(x)$  which is continuous and differentiable, and if we have two points  $x_0$  and  $x_1$  such that  $f(x_0) \neq 0$  and  $f(x_1) \neq 0$ , then we can find a sequence of points  $x_2, x_3, x_4, \dots$  such that  $f(x_n) \rightarrow 0$  as  $n \rightarrow \infty$ . This is done by taking  $x_2 = (x_0 + x_1)/2$ , and then  $x_3 = (x_2 + x_1)/2$ , and so on. This method is very easy to use, and it is very accurate. It is especially useful for finding the roots of a function, and for finding the values of a function at points where it is not defined.

The fifth of these is the method of the regula falsi method, which is a method which is very easy to use, and which is very accurate. It is based on the fact that if we have a function  $f(x)$  which is continuous and differentiable, and if we have two points  $x_0$  and  $x_1$  such that  $f(x_0) \neq 0$  and  $f(x_1) \neq 0$ , then we can find a sequence of points  $x_2, x_3, x_4, \dots$  such that  $f(x_n) \rightarrow 0$  as  $n \rightarrow \infty$ . This is done by taking  $x_2 = x_1 - f(x_1)(x_1 - x_0)/(f(x_1) - f(x_0))$ , and then  $x_3 = x_2 - f(x_2)(x_2 - x_1)/(f(x_2) - f(x_1))$ , and so on. This method is very easy to use, and it is very accurate. It is especially useful for finding the roots of a function, and for finding the values of a function at points where it is not defined.



bases. Upper leaves small, subulate, acute, usually adpressed, withering at the tips; basal leaves may be larger and linear. Flowers in few-flowered, terminal cymes. Bract reaching to about the top of the ovary, round backed and thickened in the upper half, upper surface flat. Bracteoles similar to the bracts but more slender and a little shorter. Flower almost sessile, about 2 mm. in length. Perianth with spreading segments and a short tube; perianth segments with the edges minutely papillose, thickened and hump-backed at the apex. Stamens inserted at the top of the perianth tube, exserted; back of the anther attached to the perianth by a tuft of hairs; filaments in the open flower one and a half to twice the length of the anthers. Style well developed, equalling or projecting very slightly beyond the stamens. Fruit about 7 mm. in length, crowned by the persistent, erect perianth, narrowed at the base which is cream in colour and deeply 5-lobed; above this lobed basal portion

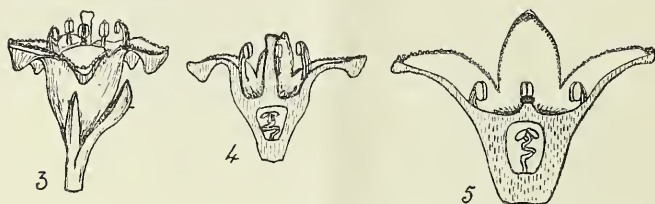


FIG. 3. *Thesium pseudovirgatum*. External view of the flower showing bract and a bracteole  $\times 7\frac{1}{2}$ .

FIG. 4. *T. pseudovirgatum*. Longitudinal section through a flower  $\times 7\frac{1}{2}$ .

FIG. 5. *T. commutatum*. Longitudinal section through a flower  $\times 15$ .

the fruit is smooth when fresh but with the veins becoming visible when dry.

Type (in the Bolus Herbarium). *Levy* 7110, Rooihogte, Cape Peninsula.

A comparison of the three species *T. virgatum*, *T. pseudovirgatum* and *T. commutatum* seems desirable as superficially they are much alike. *T. virgatum* is widely distributed on the Cape Peninsula and appears to be the only one of the three species occurring North of Constantia Nek. The other two range from Constantia Nek southwards, and south of Smitswinkel Bay they are much more common than *T. virgatum*. The habit is similar but *T. commutatum* is usually much more densely branched than the others. In *T. virgatum* the inflorescence is somewhat corymbose but in the others the cymules do not reach a common level. The flower in *T. virgatum* has a definite pedicel, in *T. pseudovirgatum* it is almost sessile and in *T. commutatum* the pedicel is entirely absent.

The bracts and bracteoles are relatively large in *T. commutatum* where they exceed the perianth tube in length. The size of the bract and bracteole in *T. pseudovirgatum* is shown in Fig 3. In *T. virgatum* they are yet smaller. Good diagnostic characters are provided by the perianth. In both *T. virgatum* and *T. commutatum* the lower part of the perianth is saucer-like (Fig. 5). In *T. pseudovirgatum* it is more like a cup (Fig. 4). On the outside of the perianth glandular patches are present in all three species but they are much more conspicuous in *T. virgatum* than the others. Both *T. virgatum* and *T. pseudovirgatum* have well developed humps on the back of the perianth lobes at the apex (Figs. 3 and 4). This hump is only slightly developed in *T. commutatum* (Fig. 5). The stamens have short filaments in *T. virgatum* and *T. commutatum* (Fig. 5), but long, well developed filaments in *T. pseudovirgatum* (Fig. 4). The length of the style bears a direct relation to the length of the stamens in all three species (Figs. 4 and 5). The long style of *T. pseudovirgatum* is a useful diagnostic feature in distinguishing this species from the other two.

The fruits afford good means of identifying the species, but a word of caution is necessary. In dried herbarium material the veins on the fruit usually become prominent and these are often used as a specific character. In fresh material these veins may be quite obscure and only become evident after drying. As most species of *Thesium* shed their fruits before they are completely dry, the fruits found on any particular specimen gathered for identification will not necessarily have characters in the fresh fruit such as will become evident after drying. As descriptions of almost all South African species of *Thesium* have been drawn up from herbarium material, it follows that these descriptions do not always fit the fruit when fresh. For instance in the three species under consideration all have prominent veins when dried but in both *T. virgatum* and *T. pseudovirgatum* these are obscure in the middle portion when fresh. The fruits illustrated in Fig. 6 were ripe fruits, ready for shedding but not completely dry. They are all drawn to the same scale. In *T. virgatum* and *T. pseudovirgatum* a prominently 5-ribbed pedestal is present. In *T. commutatum* this pedestal is relatively shorter and though it may be obscurely lobed, the well-marked ribs of the other species are never present. Ten conspicuous ribs with minor irregular ridges running between them are usually evident on the body of the fruit when it is ready for shedding in *T. commutatum*. In *T. virgatum* the ten ribs are either absent or just visible when the fruit is shed and the intervening ridges are not evident. *T. pseudovirgatum* has a similar fruit but here only five of the ribs are eventually seen to run from the pedestal to the perianth, the five intermediate ribs being incomplete. In all cases drying brings the

ribs into prominence so that descriptions based on herbarium material alone would give all fruits as ribbed with reticulations between the ribs. In *T. commutatum* a depression is formed below the junction of adjacent perianth segments. This depression is completely lacking in the other two species and affords a sure means of identifying *T. commutatum*.

***Thesium sedifolium*, A.DC. ex Levyns.**

The plant which is known at present as *T. crassifolium* Sond. has no right to this name as the name *T. crassifolium* had been applied many years earlier to another plant by Robert Brown (Prod. Fl. Nov. Holl.,

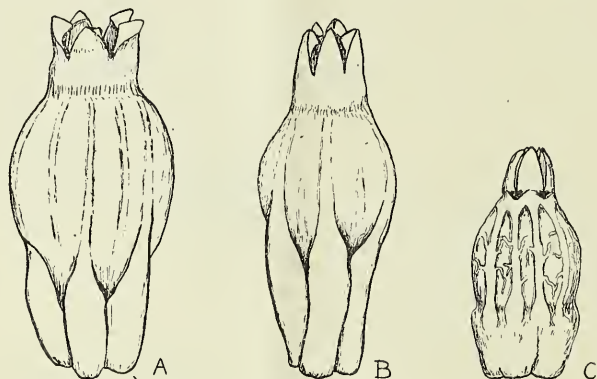


FIG. 6. Fruits. A. *Thesium virgatum*. B. *T. pseudovirgatum*. C. *T. commutatum*. All  $\times 7\frac{1}{2}$ .

p. 353). In the Flora Capensis (Vol. V, sect. 2, p. 149) A. W. Hill writes that a specimen of *T. crassifolium* R. Br., preserved in the British Museum, is undoubtedly *T. Frisea* L. var. *Thunbergii* A.DC. *T. crassifolium* R. Br. is therefore a synonym of *T. Frisea* L. and it is illegitimate for the name *crassifolium* to be used again in this genus. A. De Candolle (Prod. XIV, p. 660) gives amongst the synonyms of *T. crassifolium* Sond. *T. sedifolium* A.DC. ined. It is therefore proposed to revive the name for this species.

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